Formal Matters

Upon review of the specification, an error of a typographical nature was noted in the literal English translation of the application which was carried over into the Substitute Specification. In particular, at page 5, line 1 of the literal English translation, "10" was written as "1.0". Accordingly, by the present amendment this error is being corrected in the Substitute Specification.

Applicants respectfully submit that the error of a typographical nature is being corrected by the present amendment, and no further documents and/or should be necessary. However, if documents and/or fees are considered to be necessary by the Patent and Trademark Office, the Patent and Trademark Office is requested to make such indication in its next communication. Moreover, if any fees are associated with this correction, authorization is hereby provided to charge any required fee to Deposit Account No. 19-0089.

Response To Rejections Based Upon Prior Art

The following rejections are set forth in the Office Action:

(A) Claims 8-20, 23, 27, 28, 30, 33 and 34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kudo et al. (hereinafter "Kudo"), JP 57-210941;

(B) Claims 21, 22, 24-26, 29, 31, 32 and 35-38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kudo, JP 57-210941, and further in view of Smith et al. (hereinafter "Smith, U.S. Patent No. 6,287,398.

(C) Claims 8-13, 15, 16, 20, 21, 33 and 34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kato, JP 56-084445, and Kudo, JP 57-210941 (Apparently this rejection is only over Kato because Kudo is not discussed in the body of the rejection. Therefore, the rejection is being addressed as being only based upon Kato.)

Regarding these obviousness rejections, Applicants initially note that in each of Kato and Kudo no special smelting process has to be used and the nitrogen contained in the alloys disclosed therein remains in solution even during solidification. However, as will be discussed in more detail below, the presently disclosed and claimed invention is directed to an alloy with improved properties, and which makes use of pressure metallurgy or powder metallurgy to achieve the recited alloys and its accompanying properties.

Instead, as will be discussed more fully below, Kato discloses alloys having high manganese contents of 5 to 15 % by weight, which is important in view of lead oxide corrosion. Still further, Kudo does not utilize a pressure metallurgy process. See, for example, Kudo page 15, paragraph 3. For this reason, Kudo has an upper limit of nitrogen set at 0.3 % by weight, because otherwise difficulties arise in terms of smelting and deforming technology, as seen, for example, Kudo page 10, last paragraph through page 11. Still further, no alloy composition is disclosed in the Tables of Kudo that is within Applicants' claims, particularly with respect to nitrogen, chromium and silicon, and there is no motivation following the entire disclosure of Kudo to arrive at Applicants' disclosed and claimed invention.

Expanding upon the above, attention is once again directed to MPEP 2144.05 wherein criteria for regarding optimization of ranges is presented. Moreover, while it is noted that court decisions, such as In re Lance G. Peterson et al, (02-1129), decided January 8, 2003, place a

burden on Applicants in establishing patentability when elements in alloys in the prior art are close to and/or overlap the ranges of elements recited by Applicants, the disclosure of the references is of such breadth that Applicants' invention is not specifically disclosed in either of Kudo or Kato. Moreover, it would not have been obvious to manipulate variables in either of Kudo or Kato in the manner asserted in the rejection to arrive at Applicants' invention. Still further, one having ordinary skill in the art would not seek to optimize variables in either of Kato or Kudo in the manner asserted in the rejection. Moreover, Applicants' alloy has advantageous properties not taught or suggested in the alloys disclosed in the prior art.

In the instant situation, Applicants' claimed invention provides a creep-proof and corrosion-resistant nickel-based alloy. In this regard, the Examiner's attention is once again directed, for example, to paragraph [0014] of Applicants' substitute specification wherein it is disclosed that the advantages achieved according to the invention are essentially based on the fact that, at temperatures of up to 1200 °C, intercrystalline creeping in the material is largely prevented due to stable deposits in the intercrystalline regions and an increased mixed crystal hardening is achieved. Additionally, it is disclosed that the adhesion of chromium spinel and such layers to the surface is increased, causing an improved high-temperature corrosion resistance of the components. Still further, the Examiner's attention is directed, for example, to Applicants' examples, such as illustrated in Tables 2 and 3. These tables clearly show that a deviation from a combination of alloy elements according to the invention in the given concentration ranges results in a deterioration of the mechanical properties of the alloys.

As can be seen, the instantly claimed invention is not rendered obvious over Kudo, Kato, and/or Smith. In particular, it is noted that to establish a *prima facie* case of obviousness wherein

ranges are claimed, the rejection must establish motivation for arriving at the ranges claimed by Applicants. Moreover, the rejection must establish that the particular variables being modified are result effective variables. See In re Antonie, 195 USPQ 6 (CCPA 1977). In the instant situation, there is no teaching or suggestion in the prior art to arrive at the creep-proof and corrosion-resistant nickel-based alloy recited in Applicants' claims.

Kudo is directed to an alloy for high strength oil well pipe with superior stress corrosion cracking resistance by adding certain components in specified ratios; Kato is directed to an inexpensive heat-resistant alloy which is excellent in corrosion resistance and strength at high temperatures wherein a part of Ni of an NI-based alloy is replaced with Mn and appropriate amounts of elements capable of increasing strength at high temperatures and C and N producible with the dissolution of the air; and Smith is directed to high strength alloy tailored for high temperature mixed-oxidant environments. Thus, there is no teaching or suggestion in any of the prior art utilized in the rejections of record to arrive at Applicants' disclosed and claimed invention.

For example, claims 8 and 33 recite up to 0.60 wt% Mn. This is in contrast to the disclosure of in Kato of 5-15% by weight Mn. Also, it is noted with respect to claim 31 that this claim relates to a nickel-based alloy according to claim 8 with manganese (Mn) up to 0.60% by weight, and boron (B) up to 0.01 % by weight. In contrast, a boron-free alloy is apparently disclosed in Kudo, and Kato relates to nickel-based alloys featuring 5-15% by weight manganese. It would not have been obvious to arrive at a nickel-based alloy according to claim 8 with the manganese and boron contents listed in claim 31 to achieve an improved creeping strength.

Moreover, as previously noted, Smith discloses a nickel alloy which, at least for its disclosure of an iron content of at least 18% by weight, an aluminum content of at least 3% by weight and a nitrogen content of no more than 0.1% by weight, is far from the alloy composition according to the invention. Furthermore, such an alloy features only chromium carbide deposits, i.e., no nitride deposits. Boron is used in such an alloy to improve the hot forming property and as a deoxidant. Applicants respectfully submit that it cannot be concluded from this that a significantly improved creeping strength or a stabilization results, as indicated according to the present invention, with the general teaching of Kudo with respect to boron as an alloying element.

Moreover, as discussed above, the manipulation of ranges in the instant situation requires the manipulation of a number of broad ranges. There is absolutely no direction in any of the references utilized in the rejections to arrive at Applicants' invention.

Applicants note that the nickel-based alloy according to the invention includes the recited components their amounts to achieve highest creep resistance at high temperatures as well as high corrosion resistance. This applies in particular to the nitrogen content of 0.2 to 0.90 % by weight. Because the content of nitrogen-solvent elements Mn and Cr in total is not sufficient to keep the necessary nitrogen content of the alloy in solution at atmospheric pressure, special processes must be used in the production of the nickel-based material, such as disclosed in paragraph [0025] of Applicants' Substitute Specification. The known DESU process is advantageously used in order to set the necessary nitrogen contents in the Ni-based alloy according to the invention using high pressurization.

As noted above, KUDO discloses an alloy for high-strength pipes for use in oil field technology, which alloy features a superior stress fracture- and corrosion resistance. Oil field pipes have to be completely non-magnetic at the ambient temperature, because geomagnetic field sensors are installed in the pipe for measuring and controlling the drill direction in the course of a deep-hole drilling. Moreover, it is important for these alloys to be highly corrosion-resistant to chloride solutions, for them to have a high resistance to stress fracture corrosion that is triggered by chloride solutions. Finally, the material must have a high strength, because the drill bit is often jammed in rock, and great tensile forces are necessary to get it out of the borehole. The alloy disclosed by Kudo is designed for these stresses in terms of alloy technology at essentially room temperature, whereby the nitrogen contents must be below 0.30 % by weight, because production by means of pressure metallurgy is not provided.

A heat-resistant, Ni-based alloy with excellent corrosion resistance at high temperatures, as proposed by Kato, features nitrogen contents of 0.10 to 0.60 % by weight. These high nitrogen contents can be dissolved in the alloy with production below atmospheric pressure only if the element Mn is added in high contents (5.0 to 15.0 % by weight) as the element keeping nitrogen in solution. However, high Mn contents impair the resistance of the alloy to creep at high temperatures.

A nickel-based alloy proposed by Smith has a great high-temperature strength through a precipitation of Cr_7C_3- phases. In comparison with the nickel-based alloy according to the invention, the nitrogen contents are low, however, the aluminum and iron contents are high and are outside the concentration limits of the material according to the invention, which features in particular high creep resistance.

Thus, the Ni-based alloys according to Kudo, Smith, and Kato can be produced at atmospheric pressure. With respect to the high temperature properties, the nickel-based alloy according to the invention has a composition with such a high nitrogen content that it can only be produced using pressure metallurgical processes.

Applicants respectfully submit that a prima facie case of obviousness cannot be established based upon the prior art utilized in the rejections. However, even if a prima facie case of obviousness could be established in this case, the instantly claimed invention yields unexpected results sufficient to rebut a prima facie case of obviousness. In this regard, In re Soni, 34 U.S.P.Q.2d 1684, 1687-1688 (Fed. Cir. 1995), held that a showing of substantially improved results for the invention, and a statement that results were unexpected suffices to establish unexpected results absent evidence to the contrary. Id. at 1687-88. In the instant case, the superior characteristics of the claimed invention are disclosed throughout the specification, and indicated in the Examples.

Moreover, Applicants note that claims 33-38 are directed to an embodiment wherein the creep-proof and corrosion-resistant nickel-based alloy consists essentially of the recited materials. However, the rejections of record do not address this claimed subject matter.

Accordingly, the rejections of record should be withdrawn as improper, and all of the claims should be indicated as allowable over the prior art.

CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection of record, and allow all the pending claims.

Allowance of the application is requested, with an early mailing of the Notices of Allowance and Allowability.

If the Examiner has any questions or wish to further discuss this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Respectfully submitted,
Markus SPEIDEL, et al.

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APPENDIX
MARKED UP COPY OF SPECIFICATION AMENDMENT

Marked up copy of amended paragraph [0021]:

[0021] In order to achieve a II phase as stable as possible during high modification temperatures of the material and, simultaneously, an effective mixed crystal hardening as well, it is advantageous for the nickel-based alloy to be provided with a total concentration of molybdenum and tungsten in wt-% according to the formula

$Mo + W/2 = 3.0$ to [1.0] 10, preferably 4.0 to 8.0.

MARKED UP COPY OF AMENDED CLAIM 8

8. (Twice Amended) Creep-proof and corrosion-resistant nickel-based alloy comprising, in wt-%:

0.0015 to 0.60 carbon (C);

0.20 to 0.90 nitrogen (N);

22.0 to 32.0 chromium (Cr);

5.0 to 20.0 elements of the groups 4, 5, and 6 of the periodic table, except Cr;

0.03 to 3.0 aluminum (Al);

0.4 to 3.0 silicon (Si);

maximum of 0.014 phosphorus (P);

maximum of 0.004 sulfur (S);

up to 0.60 manganese (Mn);

minimum of 51 of nickel (Ni) or a combination of nickel (Ni) and cobalt (Co); and

melting-related contaminants.